



PROGRAM:	Environmental Agriculture Program
EFFECTIVE REGULATION(s):	<i>Water Quality Control Commission Regulation 5 CCR 1002-61</i> January 30, 2015 <i>Water Quality Control Commission Regulation 5 CCR 1002-81</i> November 30, 2013
GUIDANCE No.:	EAP-1502
DATE:	October 2015
SUBJECT:	Concentrated Animal Feeding Operations Impoundment Depth Marker Installation Guidance

Purpose

To clarify acceptable installation specifications for depth markers (i.e. staff gauges) to be installed into the impermeable clay liner at CAFO impoundments. The installation specifications discussed are not applicable at housed commercial swine feeding operations (HCSFOs) or at CAFOs with synthetic (i.e. HDPE) liners.

Introduction

The Colorado Department of Public Health and Environment's Environmental Agriculture Program (Ag Program) developed this guidance document to clarify acceptable installation specifications for depth markers (i.e. staff gauges) to be installed into the clay liner at a CAFO impoundment. This document is guidance only and should be used in conjunction with the regulatory requirements included in:

- Colorado Water Quality Control Commission Animal Feeding Operations Control Regulation, 5 CCR 1002-81, (Regulation No. 81)
- Colorado Water Quality Control Commission Discharge Permit System Regulation, 5 CCR 1002-61 (Regulation No. 61)

The installation specifications discussed in this guidance are not applicable at housed commercial swine feeding operations (HCSFOs) or at CAFOs with synthetic lined impoundments.

Background

Depth markers are necessary so that CAFOs can monitor and manage impoundments and maintain two feet of freeboard above the liquid level from the "design storm" event at all times. At a minimum, depth markers must be clearly marked in one-foot increments.

For permitted CAFOs, Colorado Water Quality Control Commission Regulation No. 61, Colorado Discharge Permit System Regulations, 5 CCR 1002-61, (Regulation No. 61) requires that accurate, permanent depth markers are in place that indicate the depth of process wastewater in each open surface liquid impoundment and tank.

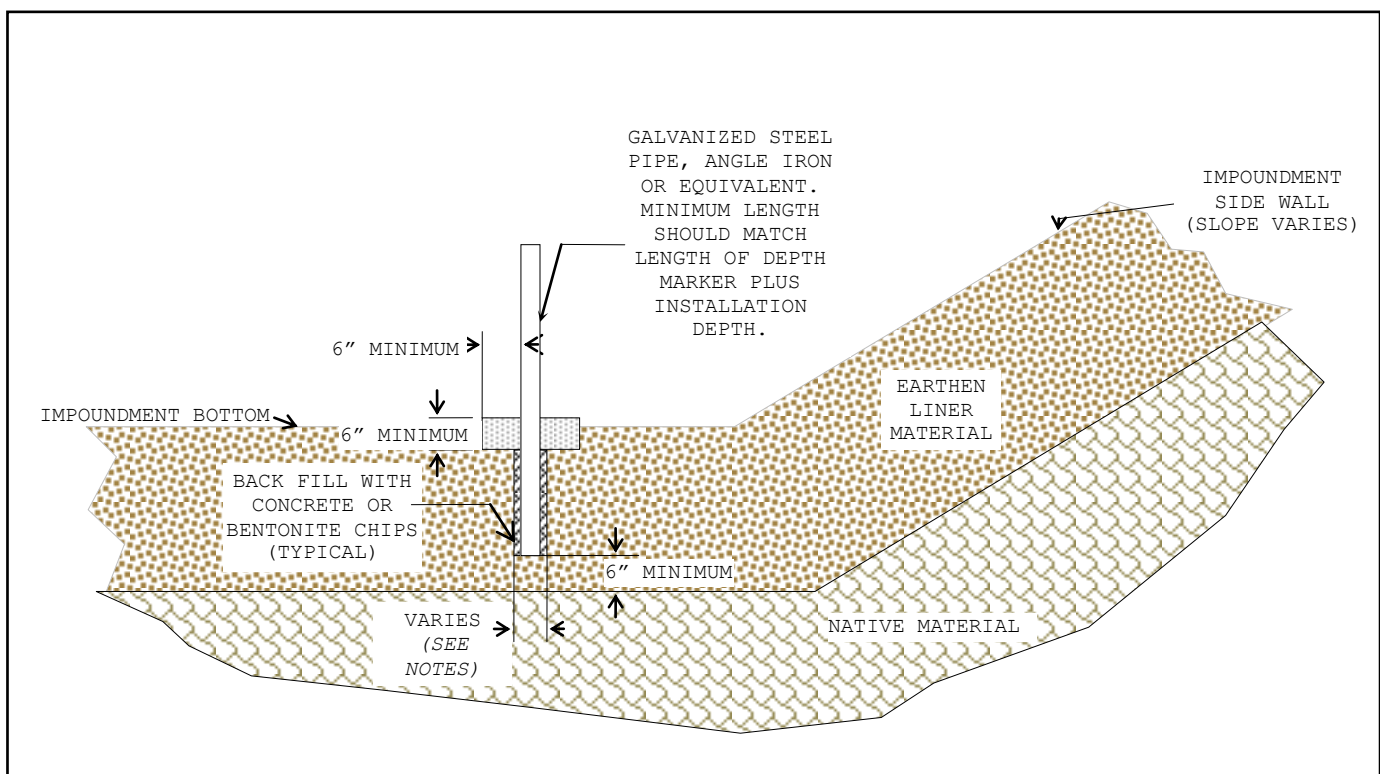
For all large CAFOs (permitted and non-permitted), Colorado Water Quality Control Commission Regulation No. 81, Animal Feeding Operations Control Regulation, 5 CCR 1002-81, (Regulation No. 81) requires installation of a depth marker in all impoundments indicated in the facility's design

calculations as being necessary to contain the design storm. Regulation 81 also requires that depth markers be installed in a manner that maintains the integrity of the impoundment liner and maintains the required seepage rate standard (generally 1×10^{-6} cm/sec).

Regulations 61 and 81 provide no installation specifications for depth markers that are protective of impoundment liners. As such, CAFOs have made various attempts to install depth markers that do not penetrate the impoundment floor for fear of jeopardizing the liner's integrity. The resulting installations (i.e. concrete-filled tires and other weighted-base markers) have proven susceptible to movement and overturning by environmental forces such as wind, precipitation, and ice.

In order to facilitate installation of depth markers capable of withstanding environmental forces, while maintaining the impermeable integrity of the impoundment liner, depth markers may be installed as described below. All such installations must be properly designed by a licensed engineer and approved by the Ag Program in advance.

FIGURE 1: Typical Depth Marker Installation - Bottom of Impoundment

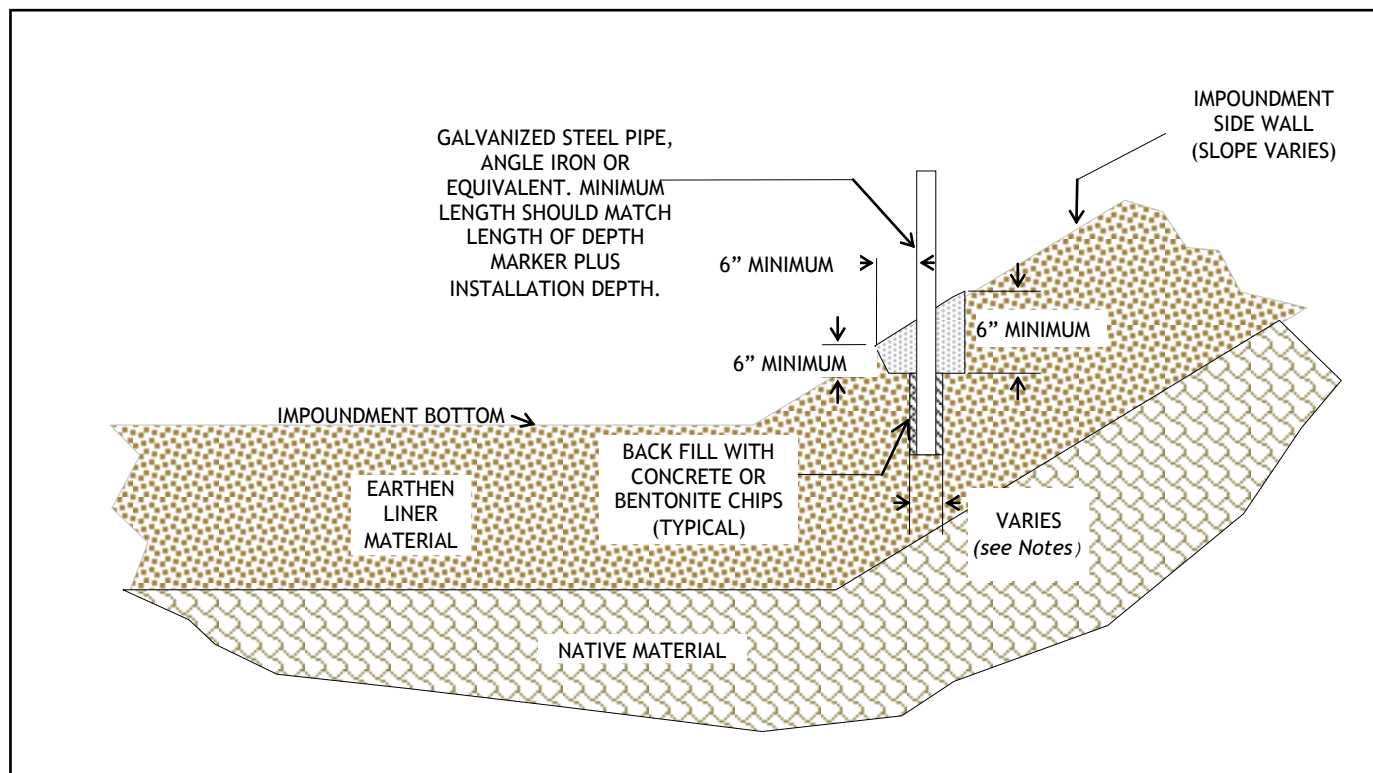


Notes:

- 1) Installation depth into liner varies depending on liner thickness (typically 1.5 feet for a 2-foot liner). At least 0.5 feet of liner must be maintained below the boring. Field verify that liner is not punctured.
- 2) Bore or excavate posthole a minimum of 2 inches larger in diameter than the post being installed. Install post and depth marker plumb. Backfill boring with bentonite chips or concrete.
- 3) Install concrete collar at surface at least 0.5 feet thick and at least 0.5 feet wide.
- 4) Permanently attach depth marker to post after post installation.

- 5) If boring or excavation punctures the liner material, the liner must be repaired and the liner integrity must be verified to meet a 1×10^{-6} cm/sec maximum seepage rate and documentation of such must be submitted to the Ag Program and stamped by a professional engineer registered in the State of Colorado.

FIGURE 2: Typical Depth Marker Installation - Sidewall of Impoundment



Notes:

- 1) Sidewall installation point (if approved by Ag Program) must be below the top of the berm by at least the approved freeboard depth (typically 2.0 feet) plus the depth necessary to contain the applicable design storm event.
- 2) Installation depth into liner varies depending on liner thickness (typically 1.5 feet for a 2-foot liner). At least 0.5 feet of liner must be maintained below the boring. Field-verify that liner is not punctured.
- 3) Bore or excavate posthole a minimum of 2 inches larger in diameter than the post being installed. Install post and depth marker plumb. Backfill the boring with bentonite chips or concrete.
- 4) Install concrete collar at surface at least 0.5 feet thick and at least 0.5 feet wide.
- 5) Permanently attach depth marker to post after post installation.
- 6) If boring or excavation punctures the liner material, the liner must be repaired and the liner integrity must be verified to meet a 1×10^{-6} cm/sec maximum seepage rate and documentation of such must be submitted to the Ag Program and stamped by a professional engineer registered in the State of Colorado.

For questions related to this guidance or concerns regarding installation of depth markers in your impoundments, please contact the Environmental Agriculture Program at 303-692-3520.